

Student Name:- _____ Student ID: _____



CS545: Web Application Architecture
Midterm Exam

Computer Professionals Program

Date: 01 - 24 -2023

Theory		Cognitive skills		
Q1 (4)	Q2 (3)	Q3-P1 (8)	Q3-P2 (12)	Q3-P3 (3)

The exam takes 150 minutes, No extension.

Please read the exam policy before you start the exam.

Do not provide more than one answer to a question. If you do so only the first one will be evaluated.

There is no tolerance policy for academic dishonesty on exams. You will be asked to leave the exam room immediately without a warning if you do or violate one of the following things which means you will get an NC.

1. You are caught cheating or trying to cheat.
2. Answers should be written with a pen or pencil, but if you want to use a pencil, please bring your own eraser and sharpener you are not allowed to borrow from other students during the exam.
3. All mobile phones should be turned off and stored with your coat or backpack. You could also place it on the instructor's desk.
4. You are not allowed to go to the restroom or go out to the room for water.
5. You are not allowed to ask or get extra papers from other students.

Question 1: Circle the correct answer

(4 points – each 1)

1) What is the suitable component stereotype annotation to place on classes that will be functioning in the presentation layer.

- a) @service
- b) @controller
- c) @repository
- d) @bean

2) To get the value of the {id} in the following code:

```
@RequestMapping("/products/{id}")
public List<Product> findProductById ( ????????? ) {
    return productService.findProductById(id);
}
```

The correct method parameter would be?

- a) @ModelAttribute("id") long id
- b) @PathVariable("id") long id
- c) @RequestParam("id") long id
- d) @RequestBody("id") long id

3) Advice executes when the target method throws an exception.

- a) @AfterReturning
- b) Advice
- c) @AfterThrowing
- d) After

4) If the cascade type was PERSIST propagates from a parent to a child entity. When we detach the 'parent' entity, the associated entity 'child' will also be detached.

- a) true
- b) false

Question 2: Short Answers

(3 points – each 1.5)

1) What is the meaning of IoC (Inversion of Control) Container?

2) List two benefits of following 'level 3' - Richardson's maturity model when designing RESTful web services.

Question 3)

Part-1

Create and annotate the domains based on the database tables given below, considering the following: (8 points)

- An **Employee** works under one **Department**
 - A **Department** can have one or more **Employees**
 - An **Employee** can work on one or more **Projects**
 - A **Project** can have one or more **Employees**
 - An **Employee** can have one **Address** and vice versa.
-
- All associations should be bi-directional
 - All primary keys should be auto-generated
 - Set JPA cascade operations as follows:
 - Deleting an **Employee** should remove its **Address**
 - When retrieving an **Employee**, it should not load all of its associations unless required.

Employee

emp_id	name	salary	address_id	dept_id
111	Zaineh	100000	1	1
112	Yasmeen	160000	2	4
113	Mira	140000	3	3
114	Shimaa	200000	4	2
115	Dean	150000	5	1

Address

address_id	city	state	zipcode
1	Fairfield	IA	52556
2	Iowa City	IA	52440
3	Morrison	IL	61270
4	Orlando	FL	34565
5	Tampa	FL	31765

Department

dept_id	name
1	Tech
2	HR
3	Finance
4	Marketing

Employee Project

emp_id	project_id
115	1
115	2
115	3
114	1
114	3
111	1
111	2

Project

project_id	project_name	estimated_days	location
1	X	180	FL
2	Y	60	FL
3	Z	80	IA

Part-2

Create RESTful web services for the Employee domain by following the n-tier architecture and implement the following requirements with best practices: (12 points)

- Implement CRUD operations – (findAll, findById, deleteById, save, update)
- Create an endpoint that returns the **Projects** for a specific **Employee**
- Create an endpoint that will retrieve all **Employees** that are working in at least one project given **location** and from a specific **department**.
For example → Works in 'FL' and from 'Tech' department. (*just an example!*)
- Create an endpoint that will search all **projects** for a given **employee** based on the following criteria: (% projectName % , >= estimatedDays , = location). It must satisfy according to given criteria (AND). The returned value should be a list of projects.

***Note:** You may focus on the Controller and Repository implementations. You may add anything specific in the service layer if you are willing to add some business logic other than the usual service calls.*

***Note:** If you need anything from the Project domain, you may assume the projectService is completely functional according to your requirement. Just add an assumption.*

Part-3

Create an Aspect class that will have an annotation called @Alert that will send a notification after any write method (create, delete, and update) on the EmployeeController. You may use the following implementation for the advice.

(3 points)

```
public void sendAlert( Joinpoint joinpoint ){  
    // implementation to send alert ...  
}
```

***Note:** Add the @Alert annotation to the EmployeeController. You do not have to fill out the implementation to send alert... . Assume it will do the required functionality.*
